Solution Stoichiometry – redo titration + ppt titration (5)

redox

(1) A 0.2865 g sample of Fe^{2+} ore is dissolved in acid and converted to Fe^{3+} by titrating with 0.02645 L of 0.02250 M $KMnO_4$. What is the mass % of Fe^{2+} in the ore?

$$5Fe^{2+} + MnO_4^{\ominus} + 8H^{\oplus} \longrightarrow 5Fe^{3+} + Mn^{2+} + 4H_2O$$

0.2865 g 0.02645 L 0.02250 M

strategy: mol $KMnO_4$ → mol $MnO_4^{\ominus}$ → mol Fe^{2+} → mass Fe^{2+} → mass %

$$1\ mol\ KMnO_4 \times \frac{1\ mol\ MnO_4^{\ominus}}{1\ mol\ KMnO_4} \quad 0.02645\ L \times 0.02250\ \frac{mol\ MnO_4^{\ominus}}{L} \times \frac{5\ mol\ Fe^{2+}}{1\ mol\ MnO_4^{\ominus}}$$

$$\times \frac{55.847\ g}{mol\ Fe^{2+}} \text{ (PT)} = 0.1662\ g\ Fe \text{ in ore}$$

$$\frac{0.1662\ g\ Fe}{0.2865\ g\ ore} \times 100\% = \boxed{58.01\%\ Fe}$$

ppt titration →

(2) How many mL of 0.100 M $AgNO_3$ are required to react with 750 mL of 0.0250 M Na_2CrO_4?

$$2AgNO_3 + Na_2CrO_4 \longrightarrow Ag_2CrO_4 + 2NaNO_3$$

mL ? 750×10^{-3} L 0.100 M 0.025 M

$$0.01875\ mol$$

$M = \frac{mol}{V}$

$mol = M \times V$

$$0.01875\ mol\ Na_2CrO_4 \times \frac{2\ mol\ AgNO_3}{1\ mol\ Na_2CrO_4} \times \frac{1\ L}{0.100\ mol\ AgNO_3} \times \frac{1000\ mL}{1\ L}$$

$$= \boxed{375\ mL}$$